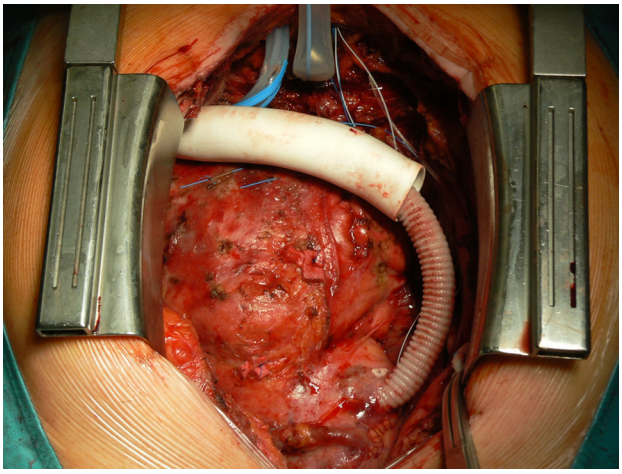

FIGURE 2. Operating field (redo median sternotomy) before closure of the sternum with polytetrafluoroethylene (Gore-Tex) graft pulled over the kinking protector and outflow graft.

removed, disconnected from the old (thrombosed or otherwise damaged) pump, and connected to the new pump. Thereafter, the polytetrafluoroethylene (Gore-Tex) graft should be closed (using suture or clips) to protect against adhesion and to facilitate any unlikely future exchange of the pump. We use the technique described for all HeartWare HVAD implantation approaches, that is, median sternotomy and left lateral or bilateral thoracotomy. To avoid twisting of the outflow graft during aortal anastomosis, the position of the black line on the outflow graft should be kept in mind.

This technique has been routinely used in our center since the last 100 HVAD implantations. No evidence of increased infection has been noted. In 2 cases in which the kinking protector was covered, pump exchange was performed fast and without any complications. During heart transplantation in the described patients, reopening of the chest and separation of the heart from pericardium also were less traumatic.

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Minimally invasive rib resection with preservation of periosteum using 1-port video-assisted thoracoscopic surgery

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Video clip is available online.

Minimally invasive thoracoscopic surgery is not just a trend but has become the standard for many operations. One-port methods have recently been introduced and have proved to be compatible with other thoracoscopic methods. We report the case of a benign rib tumor occurring in the eighth rib of a 13-year-old girl, who underwent rib resection using one-port video-assisted thoracoscopic surgery. A single 2-cm port was placed over her sixth intercostal space just below her mammary crease. The patient was discharged on postoperative day 4 without pain and was happy with the cosmesis.

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CLINICAL SUMMARY

A 13-year-old girl presented with symptoms of right chest wall pain of 1 week's duration after having been diagnosed at a local clinic with an osteolytic lesion in her eighth rib. She had no history of trauma but had a pathologic fracture. A rib series revealed an expansile osteolytic lesion in her eighth rib. A computed tomography scan revealed an expansile 1.5-cm mass with a fracture (Figure 1, *A*) and 2

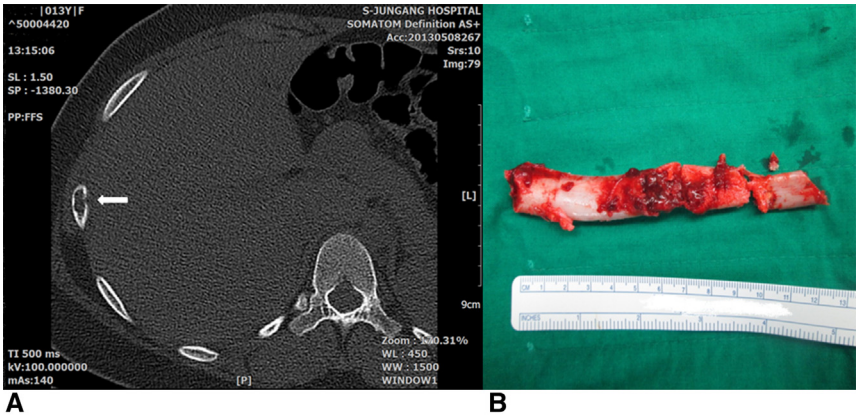

FIGURE 1. A, Computed tomography scan showing the benign tumor in her eighth rib, laterally with a pathologic fracture (*arrow*). B, The resected gross specimen showing the benign rib tumor.

nodules in both her lower lung lobes. We chose to observe the lung lesions. An operation was recommended owing to the uncertainty of the diagnosis, the symptoms of pain, and the presence of the pathologic fracture.

The patient was placed in a lateral position with a single 2-cm port in her sixth intercostal space at her midclavicular line (Figure 2, *A*). A 10-mm wound retractor was used. A 3-mm camera, 2-mm shears, and 3-mm grasper and dissector were used with electrocautery. Also, right angle, Metzenbaum scissors (Thoramet Surgical Products, Inc, Irvington, NJ) and a periosteal elevator were used to preserve the overlying periosteum. The rib was cut at both ends with a Kerrison bone punch and removed through the port (Figure 1, *B*, and Video 1). The wound was sealed with octyl-cyanoacrylate (Dermabond; Ethicon Endo-Surgery, Cleveland, Ohio).

The resected rib revealed a well-demarcated medullary expanding lesion, measuring 1.5 × 1.4 cm. Microscopically, the pathologic diagnosis of the resected lesion was Langerhans cell histiocytosis of the rib.

The postoperative course was uneventful, and she was discharged on postoperative day 4. A follow-up computed tomography scan 8 months later demonstrated disappearance of the nodule in her left lower lobe and no size change in the nodule in her right lower lobe. She had no signs of recurrence 9 months after surgery, was without pain, and was pleased with the cosmesis.

DISCUSSION

In minimally invasive procedures, the most important point to remember is not to compromise the operation. The operation must be the same as an open procedure, with comparable results. The anatomic resection must be the same, despite the approach, whether by endoscopic, robotic, or open methods. One-port thoracoscopic surgery is merely an extension of thoracoscopic methods. Langerhans cell histiocytosis of the rib is a benign entity but can vary from a benign lesion to a more infiltrative lesion. Treatment modalities include partial rib resection, radiotherapy, systemic chemotherapy, and local therapy with steroids.[1]

Our patient had a 1.5-cm expansile benign rib tumor. An open procedure would need to cover ≥2-cm margins at both ends of the mass, which can be achieved with a small 2- to 3-cm incision, but would have required pulling the incised skin over to the desired cut margins. Rib tumors beneath the scapula would require a more extensive incision.[2] The right nodule in our patient was still present at her last follow-up examination, and we might have considered

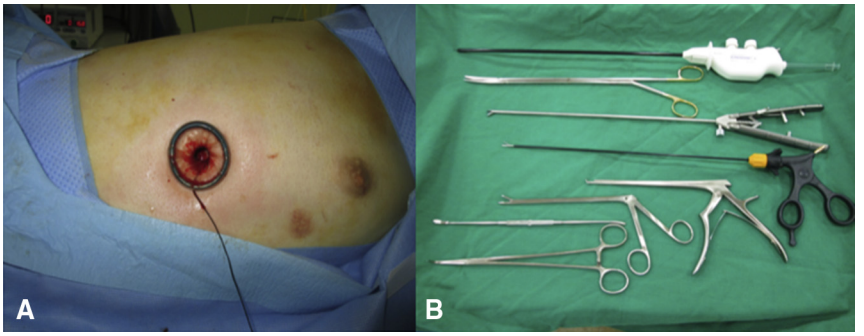

FIGURE 2. A, The single port with a wound retractor. B, Readily available instruments used during the operation.

performing wedge resection. However, at the time, complete resection would not have been possible unless both sides had been approached.

Single port resection of a benign rib tumor is feasible and can be done with readily available instruments (Figure 2, *B*). The advantages of thoracoscopic methods have been previously reported.[3] These advantages include a smaller incision, no muscle damage, and no dead space issues, which can lead to complications. Other advantages include a more rapid recovery to daily life and a shorter hospital stay. One-port methods have the same advantages, with the addition of resulting in a single scar, instead of 3. Thus, the occurrence of pain can be reduced. The procedure itself is simple and straightforward, using readily available instruments without the complex instruments necessary for a more complex procedure. Our patient was doing well and was satisfied with her outcome at the last follow-up visit.

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Maximized left atrial dome approach for left atrial tumor resection

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Video clip is available online.

Despite their rarity, cardiac tumors can present a technical challenge, both diagnostically and with regard to surgical approach and resection. Complete surgical resection remains crucial for palliation of symptoms and for its role as the mainstay of cardiac sarcoma therapy.[1-3] Because of difficult access in attempting complete resection of sarcomas involving the left atrium (LA), surgeons have used cardiac autotransplantation and ex vivo tumor resection with cardiac reconstruction and reimplantation.[3-5] We describe an alternative, compromise technique to approach these tumors by maximizing exposure with a modified LA dome approach.

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CLINICAL SUMMARY

A 50-year-old symptom-free patient with a history of smoking and diabetes was seen for a LA mass discovered on echocardiography, indicated by a cardiac murmur on routine physical examination. The echocardiogram (Figure 1, *A*, Video 1) showed a large, irregular, multilobed mass continuous with the LA medial and lateral walls and protruding through the mitral valve leaflets, causing mitral stenosis and regurgitation. Magnetic resonance imaging of the heart (Figure 1, *B*) confirmed the mass ($3.3 \times 2 \times 1.7$ cm) in the LA, with central low signal, correlating with the calcifications on computed tomographic scan (Figure 1, *C*). The tumor was extensive, with some features suggesting malignancy, but was still noninvasive on imaging. The coronary arteries were shown to be normal on cardiac catheterization. The tumor was supplied by a branch of the right coronary artery and was well vascularized.

For surgery, after median sternotomy, aortic and bicaval cannulations were performed, with the superior vena cava (SVC) cannulated high. The SVC, aorta, and pulmonary artery were divided, and the LA was widely opened with an incision that was started anterior to the right pulmonary veins, carried behind the SVC, continued along the upper edge of the roof of the LA, and ended anterior to the left pulmonary veins (Figure 2, *A* and *B*). This provided excellent exposure of the entire LA and the fibrous endocardial tumor, which covered a large portion of the LA and mitral valve. The tumor was easily peeled off, along with the endocardium of the LA (Figure 3), but was firmly attached to both valve leaflets, which were